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BIRD PHOTOGRAPHY BY THE DIRECT COLOR PROCESS.

BY FRANK OVERTON, M.D. AND FRANCIS HARPER.

MANY photographs that show the home life of wild birds are objects of great interest and beauty, but black and white pictures fail to reveal the most striking of all the characteristics of a bird — its color. Photography affords an almost perfect means of recording other important characteristics, such as size, shape, and habitat; but until recently it has been almost a total failure in recording the color of the plumage.

Hitherto the colors of birds have been represented by means of paintings and their reproductions or by means of hand-colored lantern slides. But bird-painting is an extremely slow and difficult process. The artists who are capable of adequately portraying birds are surprisingly few in number, and to satisfactorily reproduce the paintings on the printed page is almost as difficult as to make the original pictures. Consequently many of the printed pictures in color are merely keys, and few painted portraits, however pleasing their composition, are accurate in every particular. Hand-colored lantern slides are valuable and beautiful, but most of them fail to represent the bird subjects accurately or in desirable detail. Therefore, any additional means of recording vividly and minutely the natural colors of wild birds is worthy of careful study. Such a means is afforded by the use of the Lumière autochrome plates. Photographs taken upon these plates are transparencies, having the qualities of good lantern slides, with the additional quality of showing the colors in their natural tones and in pleasing detail.

An autochrome photograph may be reproduced by engraving and printing in the same way that a painting may be reproduced. But an autochrome is much fuller of microscopic detail than a painting done by hand, and this detail is too fine to be brought out by the engraver's art at the present time. An autochrome, therefore, cannot be reproduced satisfactorily upon the printed page unless it happens to be made up of masses of color without

variegated detail. But an autochrome may be used as a lantern slide, and herein lies its greatest field of usefulness. It is more dense than an ordinary slide, but a good lantern will project an autochrome photograph upon the screen with nearly all the brilliancy that the plate exhibits when held in the hand and looked through by daylight. The colors will be slightly affected by the color of the light in the lantern, but not to a greater degree than the colors of a painting are affected when seen in an artificial light.

An autochrome plate differs from an ordinary photographic plate chiefly in that a single layer of transparent, microscopical starch grains, dyed orange-red, green, and violet, and mixed in even proportion, is interposed between the glass and the sensitive coating or film. This coating is extremely thin, and is made of a panchromatic emulsion. The plate is exposed in the camera with the glass side toward the lens, so that the rays of light must pass through the colored starch grains before reaching the emulsion. Each starch grain is about $\frac{1}{2000}$ of an inch in diameter. An autochrome thus bears some resemblance to a half-tone plate, but the dots upon it are only about one fifth as large as the smallest dots upon the best half-tone plate. The density of the plate is due to the fact that the starch grains intercept a considerable amount of light.

Any plate camera may be used in taking an autochrome, and a special yellow screen, fitted to the lens, is the only extra piece of apparatus needed. If a screen is not used, the photograph will show a dominant purplish tone, owing to the excessive actinism of the violet and blue rays of ordinary light.

The main difficulty of autochrome photography lies in the length of exposure required, which is 100 times as long as is necessary for an ordinary plate. This is owing to the absorption of light rays by the color screen and by the colored starch grains. An autochrome of a wild bird is taken in the same way that an ordinary negative would be made of the same bird, except that the exposure is greatly prolonged. The fastest time in which we have taken a bird autochrome is one quarter of a second, which would correspond to $\frac{1}{400}$ of a second with an ordinary plate. On the other hand, a brooding Blue Jay in a dark thicket has posed for as long as two minutes.

The development of an autochrome is not especially difficult,

although some experience and skill are required to secure the best results. The factorial method of controlled-time development, as described in the directions accompanying the plates, enables one to control the density and contrast of the picture. The image formed by the first development of the plate is reversed in a reducing solution, and the plate is thereby converted from a negative into a positive. The first development, reversal of the image, second development, and washing, may be completed in less than fifteen minutes, and the thin emulsion may be dried in ten minutes more. An autochrome, therefore, possesses a still further advantage over a hand-colored slide in the much shorter time required for its completion.

An autochrome plate is a positive, and no satisfactory method has yet been devised for making colored prints from it directly upon photographic paper. It is well within the bounds of probability, however, that experiments which are now being conducted in this direction may eventually be successful. Fortunately, any number of duplicates may be made by photographing the first plate upon other autochrome plates, in much the same way that lantern slides are made by the use of a camera. The reproduced autochromes are not so brilliant as the originals, but they may be shown with good effect in a lantern.

We have taken several dozen bird autochromes that may be considered successful. The list includes the Laughing Gull, Common Tern, Black Skimmer, Bob-white, Fish Hawk, Flicker, Night-hawk, Blue Jay, Song Sparrow, Purple Martin, Yellow Warbler, Catbird, Brown Thrasher, and Robin. The number of our failures to secure good pictures has not exceeded the number of our successes. Our experience justifies us in stating that the autochrome method of photography affords a practical and definite means of securing brilliant and useful photographs of normal wild birds in their natural haunts, poses, and colors.